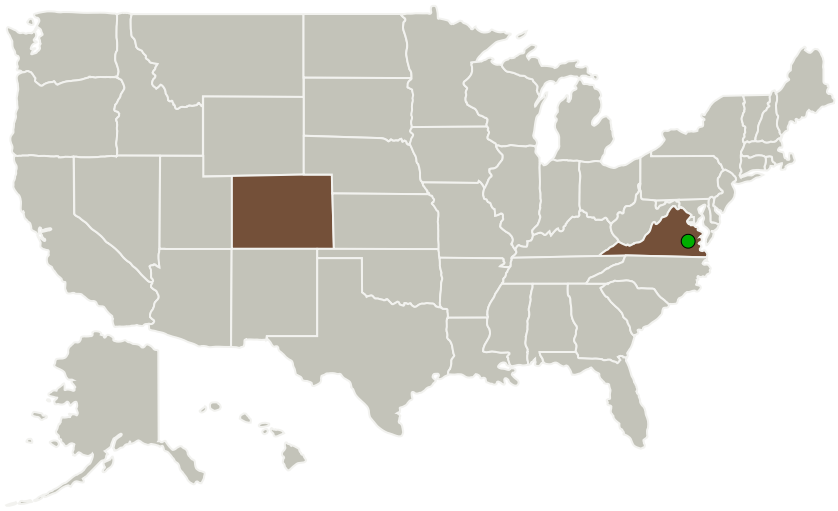
Solar Cube 2U: A Heliogyro Propulsion System for CubeSats, Phase I

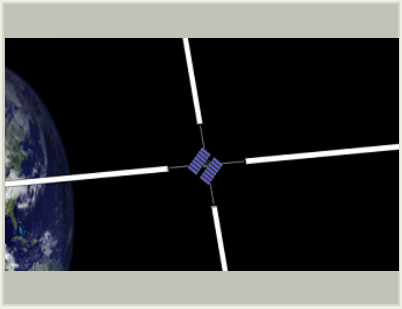
Completed Technology Project (2016 - 2016)

Project Introduction

The Solar Cube heliogyro is a CubeSat propulsion system that utilizes reflected solar pressure as its only means of propulsion and attitude control. It has the appearance of a Dutch windmill and employs sail control akin to a helicopter. Four solar reflecting blades made of ultrathin polyimide attach to a central bus. During operation, centripetal tension and chord-wise battens provide stiffness. The system uses collective and cyclic pitch of the blades to control attitude and thrust. For stowage, each blade is rolled onto a spool adjacent to its pitch actuator. For deployment, the spacecraft spins and the blades unroll in a controlled manner. The proposed Phase I effort will focus on fabrication and feasibility testing of a blade assembly, to prove that a sail blade of sufficient area can stow in the proposed volume and can deploy and pitch reliably. Phase II will mature the hardware design and develop the necessary GNC software. Eventually, Solar Cube will help CubeSats become capable of interplanetary operation, and extend their reach to places that are currently unattainable.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Altius Space Machines, Inc.	Lead Organization	Industry	Broomfield, Colorado
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Colorado	Virginia

Project Transitions

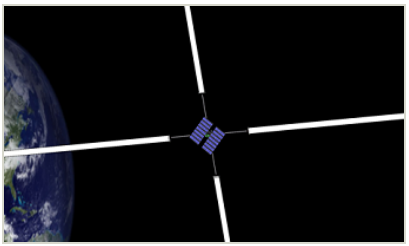
June 2016: Project Start

December 2016: Closed out

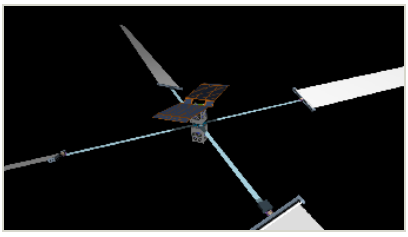
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139855)*

Images



Briefing Chart Image
Solar Cube 2U: A Heliogyro Propulsion System for CubeSats, Phase I
(https://techport.nasa.gov/image/125826)



Final Summary Chart Image
Solar Cube 2U: A Heliogyro Propulsion System for CubeSats, Phase I Project Image
(https://techport.nasa.gov/image/131027)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Altius Space Machines, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

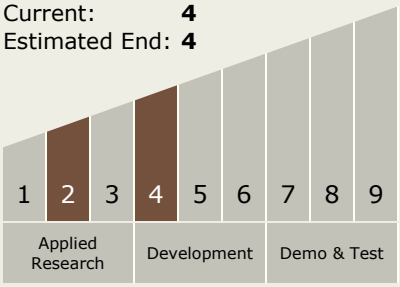
Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Richard S Blomquist

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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Completed Technology Project (2016 - 2016)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.1 Lightweight Concepts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System